and E is the irradiance. This turns out to be the same no matter how far the rear panel is away from the lens. Take the diffuser into account by convolving the rear display image with the point source before changing its scale. To get the irradiance at the retina combine all of the separate layers using point by point multiplication and sum them as in Equation 19.

$$E(x,y)=\frac{\sum_{\substack{i=1\ldots m\\ j=1\ldots n}}^{m,n} BL_0\cdot\left(PSF(x,y)*\begin{bmatrix}R(x,y)_R T(\lambda)_{Red,R}\\ R(x,y)_G T(\lambda)_{G,R}\\ R(x,y)_B T(\lambda)_{B,R}\end{bmatrix}\right)[F(x,y)_R T(\lambda)_{Red,F}F(x,y)_G T(\lambda)_{G,F}F(x,y)_B T(\lambda)_{B,F}]M^2A_{lens}\cos^4(\theta)}{z'^2} \tag{19}$$

[0111] Where BL_0 is the radiance of the backlight, PSF(x, y) is the point spread function described earlier, T_{Red}, T_G and T_B are the spectral transmission functions of the dye layers of the where second subscripts R and F designate the front and rear imaging layers respectively, M is the magnification of the thin lens system given by z'/z_O and A_{lens} is the area of the lens.

[0112] Since visual perception is very difficult to measure directly, and varies from person to person an external reference to measure the image quality of a display is required. In most work the external reference is a physical artefact that transforms radiometric quantities into numbers. For these numbers to be useful they should have at least the following two properties: (a) If the numbers describing an aspect of image quality are the same for two displays then when asked observers comparing the two displays should report that this aspect of image quality is the same (b) If the numbers describing associated with two different displays are different then an observer should be able to report which has the greater magnitude. A third useful property is where the numbers describing the magnitude of a measured quantity agree with the magnitude described by an observer. Here we are interested with two conflicting quantities (a) image "clarity" of background layers which is compromised in a MLD to reduce the (b) saliency of moiré interference produced. Vision science provides a description of the response to spatial frequency, the contrast sensitivity function (CSF), which is good starting point for producing the map between the response of the physical artefact and the "useful numbers" described. The CSF plots the contrast sensitivity (1/cutoff contrast) against angular frequency for human observers.

$$CSF(\omega)=a\omega e^{-b\omega}\sqrt{1+0.06e^{b\omega}} \tag{20}$$

-continued

$$a(\omega,L)=\frac{540\left(1+\frac{0.7}{L}\right)^{-0.2}}{1+\frac{12}{p\left(1+\frac{1}{3}\omega\right)^2}}$$

$$b(L)=0.3\left(1+\frac{100}{L}\right)^{0.15}$$

Where L is the average display luminance, p is the angular display size in degrees and ω is the angular frequency in cycles per radian related to the angular frequency of the display (cycles per radian) by

$$\omega=dv \tag{21}$$

[0113] Additionally there is no widely agreed standard for the contrast sensitivity function yet which describes the spatial response of the human visual system. At present there are several contenders which could be named as standard by the CIE, so in a preferred embodiment the CSF that becomes the standard for the art would be incorporated

[0114] A naïve display engineer about to place one image layer upon another would not expect Moiré interference or the spatial qualities of the image on the rear display to differ. This is the ideal specification. This is better expressed by stating that only the difference between two sets of images matters.

[0115] An image of text on the rear display diffused and the ideal un-diffused case, with the representations $F_{D'}$, F_D in the frequency domain.

[0116] An image of the moiré interference produced between the two layers and the ideal case of a uniform white surface the same area as the front most imaging layer, with the representation F_M,$F_{M'}$ in the frequency domain.

[0117] The square root integral function compares an original and a distorted image where signal components are weighted by the contrast sensitivity function, and the result is expressed in just noticeable differences (JND). One JND between the two images would mean a difference that was noticeable half of the time. The Square Root Integral (SQUI) is calculated as

$$J=\frac{1}{\ln(2)}\int_{v_o}^{v_{max}}\sqrt{\frac{M(v)}{M_t(v)}}\,d(\ln(v)) \tag{22}$$

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where

$$M(v)=\left|\frac{F_{X'}(v)/F_X(0)}{F_X(v)/F_X(0)}\right|$$

is defined as the modulation transfer function where $F_{X'}(v)$ and $F_X(v)$ are representations of the distorted and undistorted images in the frequency domain respectively and